

IN THE CLAIMS:

1 1. (CURRENTLY AMENDED) An intermediate network device for use in a computer
2 network having a plurality of entities configured to issue requests to reserve network re-
3 sources for use by traffic flows, the reservation requests specifying one or more flow pa-
4 rameters, the intermediate network device comprising:

5 a traffic scheduler having one or more network resources for use in forwarding
6 network traffic received at the device at different rates;

7 a classification engine configured to identify network messages belonging to re-
8 spective traffic flows based upon predefined criteria;

9 a resource reservation engine in communicating relationship with the traffic
10 scheduler and the classification engine, the resource reservation engine including a flow
11 analyzer that is configured to apply; and one or more sets of predefined heuristics that
12 are accessible by the flow analyzer, ~~wherein the flow analyzer applies the one or more~~
13 ~~sets of predefined heuristics to the one or more flow parameters specified in the reserva-~~
14 ~~tion requests to determine a type of traffic of the given traffic flow, the one or more sets~~
15 ~~of heuristics to determine the type of traffic independent of any marking values in packets~~
16 ~~of the given traffic flow that identify traffic type, and in response to the application of the~~
17 ~~one or more sets of predefined heuristics, the flow analyzer further configured to~~ selects a
18 queue and/or a queue servicing algorithm for assignment to the traffic flow corresponding
19 to the reservation request.

1 2. (ORIGINAL) The intermediate network device of claim 1 wherein

2 the classification engine is directed to identify network messages belonging to the
3 traffic flow, and

4 the traffic scheduler is directed to place network messages identified as belonging
5 to the traffic flow in the selected queue.

1 3. (ORIGINAL) The intermediate network device of claim 1 wherein
2 the selected queue is one of a priority queue (PQ) and a reserved queue, and
3 the PQ is drained before any other queues.

1 4. (ORIGINAL) The intermediate network device of claim 3 wherein
2 a first set of heuristics is provided for determining whether the respective traffic
3 flows carry real-time voice information, and
4 traffic flows that are determined to carry real-time voice information are assigned
5 to the PQ.

1 5. (ORIGINAL) The intermediate network device of claim 4 wherein the flow parame-
2 ters include one or more of an average data rate, a peak data rate and a token bucket rate.

1 6. (ORIGINAL) The intermediate network device of claim 4 wherein
2 the resource reservation engine utilizes the Resource reSerVation Protocol
3 (RSVP) specification standard, and
4 the flow parameters are located in a RSVP Reservation (Resv) message received
5 by the device.

1 7. (ORIGINAL) The intermediate network device of claim 6 wherein the flow param-
2 ters include one or more of a token bucket rate (r) value, a token bucket size (b) value and
3 a peak data rate (p) value.

1 8. (ORIGINAL) The intermediate network device of claim 7 wherein a first set of prede-
2 fined heuristics is given by the following equation:

3
$$(r \leq r') \text{ AND } (b \leq b') \text{ AND } \frac{p}{r} \leq p_to_r'$$

4 where,

5 r' is a programmable token bucket rate constant, b' is a programmable token
6 bucket size constant, and p_to_r' is a ratio of peak data rate to token bucket rate con-
7 stant.

1 9. (ORIGINAL) The intermediate network device of claim 8 wherein r' is approxi-
2 mately 12288 bytes/second, b' is approximately 592 bytes/second and p_to_r' is ap-
3 proximately 110 percent.

1 10. (ORIGINAL) The intermediate network device of claim 4 wherein
2 a reserved queue is selected for each traffic flow that does not satisfy the first set
3 of heuristics, and
4 a Weight Fair Queuing (WFQ) queue servicing algorithm is applied to the re-
5 served queues.

1 11. (ORIGINAL) The intermediate network device of claim 2 wherein the flow analyzer,
2 in response to the application of the one or more sets of heuristics, associates a selected
3 Per-Hop Behavior (PHB) with the traffic flow corresponding to the reservation request.

1 12. (ORIGINAL) The intermediate network device of claim 1 wherein
2 the resource reservation engine utilizes the Resource reSerVation Protocol
3 (RSVP) specification standard, and
4 the flow parameters are located in a RSVP Reservation (Resv) message received
5 by the device.

1 13. (CURRENTLY AMENDED) In a computer network having a plurality of entities
2 interconnected by a plurality of intermediate network devices having one or more re-
3 sources for use in forwarding network traffic flows, a method for assigning queues and/or
4 queue servicing algorithms to the traffic flows, the method comprising the steps of:
5 receiving a reservation request message specifying one or more flow parameters
6 and for a given traffic flow;
7 applying one or more sets of heuristics to the flow parameters of the received res-
8 ervation request message to determine a type of traffic of the given traffic flow, the one
9 or more sets of heuristics to determine the type of traffic independent of any marking
10 values in packets of the given traffic flow that identify traffic type; and
11 selecting a queue and/or a queue servicing algorithm for use with the given traffic
12 flow based on the application of the one or more sets of heuristics.

1 14. (CURRENTLY AMENDED) The method of claim 13 wherein a first set of heuris-
2 tics is given by the following equation:

3 $(r \leq r') \text{ AND } (b \leq b') \text{ AND } \frac{p}{r} \leq p_to_r'$

4 where,

5 r is a token bucket rate value,

6 r' is a programmable token bucket rate constant,

7 b is a token bucket size value,

8 b' is a programmable token bucket size constant,

9 p is a peak data rate, and

10 p_to_r' is a ratio of peak data rate to token bucket rate constant.

1 15. (ORIGINAL) The method of claim 14 wherein r' is approximately 12288
2 bytes/second, b' is approximately 592 bytes/second and p_to_r' is approximately 110
3 percent.

1 16. (ORIGINAL) The method of claim 13 wherein
2 a first set of heuristics is provided for determining whether the respective traffic
3 flows carry real-time voice information, and
4 a given traffic flow that is determined to carry real-time voice information, based
5 on the first set of heuristics, is assigned to a priority queue (PQ) that is drained before all
6 other queues.

1 17. (CURRENTLY AMENDED) The method of claim-14_13 wherein ~~each~~ a traffic flow
2 that is determined to carry other than real-time voice information is assigned to a selected
3 reserved queue.

1 18. (ORIGINAL) The method of claim 17 further comprising the step of applying a
2 Weight Fair Queuing (WFQ) queue servicing algorithm to the reserved queues.

1 19. (ORIGINAL) The method of claim 13 wherein the flow parameters include one or
2 more of an average data rate, a peak data rate and a token bucket rate.

1 20. (ORIGINAL) The method of claim 13 wherein the reservation request message cor-
2 responds to a Reservation (Resv) message as provided in the Resource reSerVation Pro-
3 tocol (RSVP) specification standard.

1 21. (ORIGINAL) The method of claim 20 wherein the flow parameters include one or
2 more of a token bucket rate (r) value, a token bucket size (b) value and a peak data rate
3 (p) value.

1 22. (CURRENTLY AMENDED) An intermediate network device for use in a com-
2 puter network having a plurality of entities configured to issue requests to reserve net-
3 work resources for use by traffic flows, the reservation requests specifying one or more
4 flow parameters, the intermediate network device comprising:

5 means for receiving a reservation request message specifying one or more flow
6 parameters ~~and for~~ for a given traffic flow;

7 means for applying one or more sets of heuristics to the flow parameters of the
8 received reservation request message to determine a type of traffic of the given traffic
9 flow, the one or more sets of heuristics to determine the type of traffic independent of any
10 marking values in packets of the given traffic flow that identify traffic type; and

11 means for selecting a queue and/or a queue servicing algorithm for use with the
12 given traffic flow based on the application of the one or more sets of heuristics.

1 23. (PREVIOUSLY PRESENTED) The intermediate network device of claim 22, fur-
2 ther comprising:

3 means for providing a set of heuristics to determine whether the respective traffic
4 flows carry real-time voice information, and

5 means for assigning a traffic flow that is determined to carry real-time voice in-
6 formation, based on the set of heuristics, to a priority queue (PQ) that is drained before all
7 other queues.

1 24-31. (CANCELLED)

1 32. (NEW) The intermediate network device of claim 23 wherein the flow parameters
2 are selected from the group consisting of: a token bucket rate for the given traffic flow; a
3 token bucket size for the given traffic flow; and peak data rate for the given traffic flow.

1 33. (NEW) A method for assigning appropriate queues in an intermediate network de-
2 vice to traffic flows that pass through the intermediate network device, the method com-
3 prising the steps of:

4 receiving a reservation request message specifying one or more flow parameters
5 that describe a given traffic flow;

6 comparing the one or more flow parameters to one or more constants stored in a
7 memory of the intermediate network device; and

8 in response to the step of comparing, determining a type of traffic for the given
9 traffic flow independent of any marking values in packets of the given traffic flow that
10 identify traffic type;

11 directing the given traffic flow to a queue adapted for the determined type of traf-
12 fic.

1 34. (NEW) The method of claim 33 wherein the determined type of traffic is real-time
2 voice traffic and the queue adapted for the determined type of traffic is a priority queue
3 (PQ) that is serviced with preference over other queues.

1 35. (NEW) The method of claim 33 wherein a first one of the one or more flow paramete-
2 rs is a token bucket rate and the step of comparing further comprises the step of:
3 comparing the token bucket rate of the given traffic flow with a programmed to-
4 ken bucket rate constant descriptive of a particular type of traffic.

1 36. (NEW) The method of claim 33 wherein a first one of the one or more flow paramete-
2 rs is a token bucket size and the step of comparing further comprises the step of:
3 comparing the token bucket size of the given traffic flow with a programmed to-
4 ken bucket size constant descriptive of a particular type of traffic.

1 37. (NEW) The method of claim 33 wherein a first one of the one or more flow paramete-
2 rs is a peak data rate and a second one of the one or more flow parameters is a token
3 bucket rate and the step of comparing further comprises the step of:
4 comparing the ratio of the peak data rate to the token bucket rate with a
5 programmed peak data rate to token bucket rate constant descriptive of a particular type
6 of traffic.

1 38. (NEW) The method of claim 33 wherein the marking values are differentiated ser-
2 vices codepoint (DSCP) values.

1 39. (NEW) The method of claim 33 further comprising the step of:
2 associating a selected Per Hop Behavior (PHB) with the given traffic flow in re-
3 sponse to the step of comparing.

1 40. (NEW) An intermediate network device configured to assign appropriate queues to
2 traffic flows that pass through the intermediate network device, the intermediate network
3 device comprising:

4 a communication facility configured to receive a reservation request message
5 specifying one or more flow parameters that describe a given traffic flow;

6 a flow analyzer configured to compare the one or more flow parameters to one or
7 more constants stored in a memory of the intermediate network device and to determine a
8 type of traffic for the given traffic flow independent of any marking values in packets of
9 the given traffic flow that identify traffic type; and

10 a traffic scheduler configured to direct the given traffic flow to a queue adapted
11 for the determined type of traffic.

1 41. (NEW) The intermediate network device of claim 40 wherein the determined type of
2 traffic is real-time voice traffic and the queue adapted for the determined type of traffic is
3 a priority queue (PQ) that is serviced with preference over other queues.

1 42. (NEW) The intermediate network device of claim 40 wherein a first one of the one
2 or more flow parameters is a token bucket rate and the flow analyzer is further configured
3 to compare the token bucket rate of the given traffic flow with a programmed token
4 bucket rate constant descriptive of a particular type of traffic.

1 43. (NEW) The intermediate network device of claim 40 wherein a first one of the one
2 or more flow parameters is a token bucket size and the flow analyzer is further config-
3 ured to compare the token bucket size of the given traffic flow with a programmed token
4 bucket size constant descriptive of a particular type of traffic.

1 44. (NEW) The intermediate network device of claim 40 wherein a first one of the one
2 or more flow parameters is a peak data rate and a second one of the one or more flow pa-
3 rameters is a token bucket rate and the flow analyzer is further configured to compare the
4 ratio of the peak data rate to the token bucket rate with a programmed peak data rate to
5 token bucket rate constant descriptive of a particular type of traffic.

1 45. (NEW) The intermediate network device of claim 40 wherein the marking values are
2 differentiated services codepoint (DSCP) values.

1 46. (NEW) The intermediate network device of claim 40 wherein the flow analyzer is
2 further configured to associate a selected Per Hop Behavior (PHB) with the given traffic
3 flow in response to the comparison.

1 47. (NEW) A computer-readable media containing executable program instructions for
2 assigning appropriate queues in an intermediate network device to traffic flows that pass
3 through the intermediate network device, the executable program instructions comprising
4 program instructions configured to:

5 receive a reservation request message specifying one or more flow parameters
6 that describe a given traffic flow;

7 compare the one or more flow parameters to one or more constants stored in a
8 memory of the intermediate network device; and

- 9 determine, in response to the comparison, a type of traffic for the given traffic
10 flow independent of any marking values in packets of the given traffic flow that identify
11 traffic type;
12 direct the given traffic flow to a queue adapted for the determined type of traffic.